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ABSTRACT

The Eastern Virginia Area Health Education Center (AHEC) Program provides the organization and funding for implementing substantial linkages among the Eastern Virginia Medical School, affiliated institutions, and health-care professions; and establishing a center in the adjacent geographic services areas. The Bureau of Health Manpower contract mandates the evaluation of the program and each center to improve the supply, distribution, quality, use, and efficiency of health personnel in the health service delivery system in the AHEC area. To meet this requirement, an evaluation has been developed and categorized according to four program components: health practitioner distributions, student recruitment/retention, learning resources, and educational programs. This paper addresses the physician population/distribution component only. Its major purpose is to critique the methodologies currently in use to project physician requirements so as to identify a defensible model to be implemented by the Eastern Virginia AHEC program. The first section of the paper describes two major models for estimating physician requirements: need-based and demand-based. Included are examples of techniques from each: two need-based models, Graduate Medical Education National Advisory Committee (GMENAC) and Health Needs; and two demand-based models, Health Manpower/Population Ratio and Economic (Effective) Demand. The next section discusses the rationale for selection of techniques to be implemented by the Eastern Virginia AHEC program. The final section describes the connection between physician estimates and the planning objectives of the AHEC program. (KC)

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HEALTH MANPOWER ASSESSMENT WITHIN THE FRAMEWORK OF AREA HEALTH EDUCATION CENTER EVALUATION

PRESENTED AT THE
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Health Manpower Assessment Within the Framework of Area Health Education Center Evaluation

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INTRODUCTION

The Eastern Virginia Medical School is a community-based medical school providing educational experiences in hospitals, community health centers, and physician offices throughout seven cities which comprise the two standard metropolitan urban areas in Health Service Area V of Virginia. Affiliations exist with twenty-seven area hospitals and seven institutions of higher learning. The regional approach to medical education departs from the traditional model of a single university-staffed hospital providing virtually all of the students' training.

Several health-care facilities have had only limited participation in health professions education because of their geographic remoteness and the developmental status of the school itself. The Eastern Virginia Area Health Education Center (AHEC) Program instituted this past year provides the organized mechanism and partial funding for implementing substantial linkages between the medical school, affiliated institutions, and health-care professionals in the adjacent geographic service areas. The Program is designed to establish an AHEC Center in each of two rural and two urban service areas.

The Bureau of Health Manpower contract mandates the evaluation of the effectiveness of the Program and each Center to improve the supply, distribution, quality, utilization, and efficiency of health personnel in the health service delivery

system in the area served by the AHEC. The medical school is also responsible for assessing the quality of all education taking place in the Centers. The challenge to the AHEC Program has been and remains the development of an evaluation plan which is affordable, manageable and valid, and improves program accountability. In developing the evaluation plan, the goals of the Eastern Virginia AHEC have been categorized according to four program components: health practitioner distributions, student recruitment/retention, learning resources, and educational programs reflecting the disciplines of allied health sciences, dentistry, medicine, nursing, and pharmacy at undergraduate, graduate, and continuing education levels. The evaluation plan is directed toward determining the goal accomplishments of operating Centers and of the overall Program. As shown in the Figure, the plan examines distributions through five of the six evaluation tasks.

Eastern Virginia Area Health Education Center (AHEC) Program
Summary of the Plan for Evaluating the Centers and Overall Program

Program Component / Evaluation Task		Description of Baseline Status		Needs Assessment		Specification of Objectives		Documentation of Program Activities		Policy Analysis		Outcome Evaluation	
Health Practitioner Distributions	Geographic		P*	C		C	P				P	C	P
	Medical Primary Care		P	C		C	P				P	C	P
Student Recruitment/ Retention			P	C		C		C				C	P
Learning Resources System			P		P		P						P
Health Sciences Educational Programs			P	C	P	C	P	C**			P		P

Legend: *P = Program-focused evaluation;
C = Center-focused
**This documentation is in the form of Management Information System Reporting

The following five goals were identified as representing both national program goals of a project-specific nature (goals 1 through 3) and those reflecting desired impacts of the overall national program (goals 4 and 5). (1)

> Goal 1 -- Improve the geographic distribution of health professionals in the AHEC target area.
>
> Goal 2 -- Improve the specialty distribution of health professionals in the AHEC target area.
>
> Goal 3 -- Improve the quality, utilization, and efficiency of all types of health professionals in the AHEC target area.
>
> Goal 4 -- Encourage students to locate for practice in underserved areas throughout the nation.
>
> Goal 5 -- Encourage students to choose professional careers in primary care practice throughout the nation.

Given the above five goals of the national AHEC program and project contract requirements to evaluate the effectiveness of the project's program activities, the following evaluation/assessment procedures related to practitioner distributions have been designated as required:

1. conduct a needs assessment of health practitioners for the purpose of providing data for educational program planning;
2. evaluate the impact of the AHEC on the geographic and specialty distributions of health practitioners, restricting specialty issues to physicians.

The final logical step to complete the distribution analysis is to compare practitioner trends for Eastern Virginia AHEC areas with matched Virginia non-AHEC areas, similar to the national analysis undertaken by Bacon et al. (2)

Although all of the health science disciplines are contained within the Eastern Virginia AHEC Program, this paper is addressed to the physician population only. The major purpose of this paper is to critique the methodologies currently in use to project physician requirements so as to identify a defensible model to be implemented by the Eastern Virginia AHEC Program. Other relevant issues, such as the relationship between location of student training and location of professional practice, although addressed in the long-term evaluation plan of the project and recognized as significant, are excluded from this discussion.

The first section of this paper presents a description of the two major models for estimating physician requirements: need-based and demand-based. Included are examples of techniques from each: two need-based models, Graduate Medical Education National Advisory Committee (GMENAC) and Health Needs, and two demand-based models, Health Manpower/Population Ratio and Economic (Effective) Demand. The next section discusses the rationale for selection of techniques to be implemented by the Eastern Virginia AHEC program. The final section describes the connection between physician estimates and the planning objectives of the AHEC program.

SECTION I - EXISTING MODELS

A. NEED-BASED MODELS FOR PROJECTING PHYSICIAN REQUIREMENTS

> Need is that quantity of medical services which expert medical opinion believes ought to be consumed over a relevant period in order for its members to remain or become healthy as is permitted by existing medical knowledge. (3)
>
> Want is that quantity of medical services which the members of a population feel they ought to consume over a relevant time period based on their psychic preceptions of their (own) health needs. (3)

1. Original Need-Based Model: Lee and Jones Study

General Description

The classic study done by Lee and Jones (4) was the earliest major work which made use of physical disabilities and diseases of the population as bases for determining physician requirements for an existing or projected population. Epidemiological studies of disability, mortality and morbidity were used to quantify the physical conditions of the population. Professional medical panels formulated estimates of the medical resources, the frequency of physician/patient encounters and the time span for these encounters to diagnose and manage the disease or disability. Lee and Jones assumed that sufficient physician resources should be available to provide preventive services to the population as well.

The professional panels, used by the Lee and Jones study developed agreement on the following criteria:

1. the average number of weekly visits provided by an active physician (productivity standards for a full-time physician);
2. the volume of services and the intensity of services appropriate for each disease and disability groups;
3. the incidence of prevalence levels of diseases and disabilities and the identification of the number of persons who need specific types of services. (5)

The prevalence rates identified were multiplied by the projected population to yield projected at-risk populations. Norms of care were developed and multiplied by the at-risk population to yield total service needs. Total service needs were then translated into necessary physicians by specialty. Consumer choice, consumer ignorance, assessibility and availability problems, and lack of purchasing power were not factored into this model as adjustments. Excluding these behavioral, socio-cultural, geographic, and financial factors as working assumptions for this and other pure need-based models masks a number of special situations; such as the following:

1. not all medically needy people seek services; (6)
2. some medically needy people seek initial services and do not follow through with routine follow-up care;
3. some medically needy people seek services, but are not accepted into the system.

The Lee and Jones technique was one of the earliest physician requirement studies to project needs in several specialties. It established the basic need-based models used for years in health professions planning.

Advantages and Strengths

The Lee and Jones method, and later derivatives of the need-based model, are normative, logical and defensible. The process results in data and conclusions justifiable on the basis of an area's medical needs. As a normative process, it is oriented toward standards of service and resource availability judged to be needed by qualified professionals in the various medical subspecialties. It is goal directed and sets targets for physician requirements based upon need rather than extrapolations of current utilization as demand-based models. For long range projections used in public policy planning (e.g., GMENAC) or program planning (AHEC), the medical need basis is more closely related to the purpose of a "national study" or a "regional physician requirement study."

Disadvantages and Weaknesses

Several conceptual and methodological problems are inherent in general need models. At the national level, it is difficult for panels of experts to work together effectively while representing their different professions, specialties, and health care institutions. The organizational problems of panels at a regional level are at least as great.

At a more theoretical level, the standards of services for physician visits required for any condition, such as hypertension, imply a given level of health status. The quantity of service established for hypertension at "X" level of mortality would differ from the quantity of service recommended for "X-1" level of mortality. (5) The goals of the national study or regional program being planned will influence the quantity of service recommended and,

in turn, the physician requirements needed to provide that level of service. Panels have difficulty in establishing service levels that are related to health status levels.

Service volumes and intensity levels are developed based on prevalence rates of diseases for a general population at the national level. The characteristics of a state or regional population are going to differ. AHEC projects are designed for service areas selected because of their lack of health resources and their unique health status problems. Nationally derived service volumes and intensity levels are not necessarily germane to the population of a medically-underserved area, a critical health manpower shortage area or an AHEC service area. Adjustments of rate for differing populations are required.

Lastly, these need-based methods bear no direct relationship to the current marketplace and its conditions. If an institution were to change its policies to graduate and train more primary care physicians, the new physician graduates, agreeing to stay in an AHEC service area, would not necessarily find employment or be able to support a professional practice. Need-based methods generally project physician requirements higher than can actually be utilized in the marketplace because of the assumption mentioned earlier. (7) The lack of adjustment to the estimate of total service needs for non-users is responsible for the high estimates.

2. Adjusted Need-Based Model: GMENAC Technique

General Description

A new adjusted-need model (5) developed by the Graduate Medical Education National Advisory Committee (GMENAC) was created following an extensive study of the need-based and demand-based methodologies in the literature. In this technique, the biological incidences of diseases are not used directly. Selected studies and data sources from actual utilization and prevalance data are used as an estimate of medical need. These estimates are expressed in rates and multiplied by the projected population.

The volume and intensity of service requirements for each disease or disability group are estimated by professional panels of physicians and are then adjusted based upon available utilization data. The norms of care are multiplied by the earlier arithmetic product to yield service needs based on disease and disability. Physician requirements for preventive medicine services and adjusted estimate of the worried well are added in to project total service requirements. These adjusted estimates of total service requirements are then allocated to various specialties for translation into headcounts. This is considered to be the most difficult step in the process because of the overlapping patterns of specialists treating the same disease group.

The GMENAC model assumes that productivity of physicians is expected to stay about the same. Practice profiles and productivity were agreed to by work-study groups for each of the various subspecialities. The GMENAC model implies that patients will not receive physician services merely because they want and can

afford services as in economic demand models. Conversely, some medical problems which require physician care do not result in care because the individual is unaware of the medical condition. While a general need-base model will over-estimate physician requirements, the GMENAC model allows for reduction of these estimates where existing data on utilization indicate no pattern of effective demand.

B. DEMAND/UTILIZATION BASED MODELS FOR PROJECTING PHYSICIAN REQUIREMENTS

> Demand is the multivariate functional relationships between the quantities of medical services that members desire to consume over a relevant time period at given levels of prices of goods and services, financial resources, size and psychological wants of the population, as reflected by consumer tastes and preferences for (all) goods and services. (3)
>
> Utilization. The end result of effective demand is an encounter or interaction with the health care system in which a service is consumed. (5)

Physician requirements forecasted using demand models are based upon the utilization of services by a specific population in the service area being examined. Observations of market behavior are used to develop rates of use which are then applied to a future population.

Three general types of demand models are represented in the literature. Some models interrelate utilization factors with a series of demographic variables such as income, race, sex education and age. (5) These demographic demand methodologies develop utilization rates for the defined portion of populations, such as women of child-bearing years 15-44, at the base year (T-1) that are multiplied by the new population estimates for that sub-population at the projected year (T-2).

Another type of demand model is based upon models of the economy. Economy-based models are broader in scope than other physician models because they take into account several occupational categories (dentists, medical technicians, nurses, physicians and others). (5) Existing economy-based models produce general estimates of physicians and are not subdivided among all the specialties. Traditional economic assumptions undergird this model producing physician and other health care professions requirements: population projections by age and

sex, labor force participation ratios for each segment of the population, estimated total labor force and growth in the Gross National Product. (8) The Gross National Product projection is divided into several segments including the consumer expenditure component which is the aggregate for the medical care subcomponent.

The Bureau of Labor Statistics has an operational economy-based model that makes several types of projections for health professions requirements. It projects a base year of employment for physicians, (e.g., 1976), projected employment for physicians in 1985, percent growth of positions from 1976 through 1985, and average annual openings from 1976 through 1985 which are divided into growth and replacement.

Economic models, a third type of demand methodology, encompass a limited set of cause and effect relationships among patients (purchasers), professional providers, available disposable income and third party reimbursement purchases. (5) Extensive data are collected on variables such as the percent of services prepaid, co-insurance options, consumer price index changes, consumer buying preferences for competing consumer goods in the marketplace, provider preferences for leisure verses higher incomes. This model attempts to explain consumer behavior, utilization of physician and medical service based upon extensive statistical analysis, and the modeling of economic trends and reimbursement relationships.

Advantages and Strengths

Generally, demand models are very useful tools for testing marketplace responses to a selected policy, program changes in funding, physician production, or

changes in physician supply that can be quantified. These policy or program options are generally developed at the national level. The GMENAC preliminary report described demand models as tools to "yield estimates for physician requirements which reflect in part the preferences of individuals for medical care." (5) These estimates reflect the "value" society places upon the services as compared to other available goods and services within the restraints of existing resources.

Demand models reflect the actual activities of the marketplace at a given point in time. Projected headcounts of primary care physicians, resulting from this analysis, are apt to relate closely to the "employment" opportunities in the economy. For this reason, these models are tools for projecting short-range options which are to be implemented in a specific area. (5)

The Bureau of Health Manpower model is an operating demand model using the demographic projection method. (8) The model contains assumptions and modeling for medical care utilization and physician productivity. Physician estimates, along with estimates of 28 other types of health professionals, are developed. Specialty specific estimates are made for general care, pediatric care, obstetric-gynecological care, psychiatric care, vision care and other medical office care professionals. The model does not provide detailed specialty-by-specialty projections. GMENAC did not find the method suitable to use for its specialty-by-specialty requirements.

Disadvantages and Weaknesses

Specific subgroups of the population, especially those with marginal financial resources or inner city or rural locations, use physician resources at levels

different from national averages. Both high and low utilization rates in demand models will be carried throughout the analysis and resulting projections. The extensive use of insurance in health care purchases shields consumers from the types of restraints they exercise in making other purchases of goods of corresponding financial value. This factor is complicated by the fact that many purchases for health care services, especially hospital services, and sophisticated diagnostic and therapeutic services, are utilization decisions made by physicians rather than patients and are influenced by the availability of third party insurance.

Present day utilization rates are used in the demand models and project into the future the utilization patterns of today. (5) These utilization patterns are influenced by consumer ignorance, access and availability problems and maldistribution of physicians and other health care professionals and health care institutions. Many of these characteristics are prominent in AHEC service areas. The comparison of physician requirements based on national utilization data with AHEC areas which have different demographic characteristics is not meaningful. Demand models are not easy for community boards and physicians who are involved in an AHEC program to use because of the statistical modeling. These models can be utilized by departments of the federal government, such as the Bureau of Labor Statistics and the Bureau of Health Manpower, where national data sources are maintained and are available. Applications of these models in small service areas are consequently limited.

Fixed Physician To Population Ratio Methods

The fixed ratio of the number of physicians per unit of population is the simplest and most used method for comparing physician requirements between particular service areas. While the ratio of physicians to population is usually based upon the number of physicians in practice in a selected geographic area, the method can be used to compare the output of any need-based or demand-based methodology.

Most applications of the fixed ratio method reflect the demand or utilization of physicians in active practice in a defined geographic service area with a known population. In the 1940s and 1950s the fixed ratio method was frequently used by states comparing themselves to the "best state." (7) For instance, a state would compare itself to its neighboring state showing the wide variation of physicians per unit of population by jurisdiction. The "best state" ratio was considered the target for the reference state.

In the 1950s and 1960s, better national data permitted states and regions to compare themselves to the national average. Dr. Fitzhugh Mayo of the Medical College of Virginia at Virginia Commonwealth University has used the physician to population ratio method to develop the requirement for primary care physicians in Virginia by using a ratio representing the average number of primary care physicians to population in western civilized countries. (9)

Advantages and Strengths

The fixed ratio of physicians to population is a very simple method which requires only limited data and is of immediate value in making general comparisons of

matched geographic areas. It can be used to provide an initial assessment (e.g., a comparison with a national average) of an area's status before more detailed analysis is undertaken.

Disadvantages and Weaknesses

The fixed ratio to population method ignores changes in population composition and masks the differences in effective medical demands of demographic subpopulations. These problems are lessened by adjusting for age, sex or racial differences in the population (or denominator).

C. GENERAL CONCLUSIONS FROM THE LITERATURE ON PHYSICIAN MODELS

1. The Lee and Jones study projected physician requirements from a comprehensive need-based method in 1933. It was the earliest extensive study of this type to use this base and project requirements specialty-by-specialty. Earlier studies used larger aggregates of physicians without specialty detail. The GMENAC technique is a derivative of this and similar models.

2. Physician requirement studies that address a single specialty (or a small number of specialties) tend to estimate a greater requirement for that specialty. Studies that encompass a full range of medical and surgical specialties develop estimates for any one specialty that are smaller and more in balance. (6)

3. Regardless of the method used, throughout the history of medical education the physician requirement purported as "the requirement or desired level" tended to increase over time. The 1933 Lee and Jones study indicated that 137 doctors per 100,000 population was the requirement. The 1967 estimate of the shortage of physicians at 50,000 in the United States, leading to other national studies and federal support for medical education, implied a physician requirement of 176 physicians per 100,000 people. A study by the National Planning Association and the Center for Priority Need indicated in 1977 that 185 physicians per 100,000 people was sufficient. Whatever was recommended in studies in the 1960s was generally exceeded by the supply of active physicians in the 1970s. (7)

While the supply of physicians expanded in the 60s and 70s, and higher physician requirement estimates were given, no surplus of physicians was generally postulated. It was the minority view in the 60s and 70s that too many physicians were being produced. The total demand for physician services, the visits per unit of population and the health care percentage of the Gross National Product all increased. Eventually, it became apparent that the expanding supply of physicians with increasing expenditures for services stimulated new demand. Another basis for projection of physician requirements was needed other than market behavior.

4. Demand-based models remain useful for testing programs or policy changes at the national or state level. Because these models contain data and formula on inpatient and ambulatory utilization, contingency questions (on reimbursement, supply changes, or capital expansion controls) can be posed and answers simulated which approximate the marketplace.

5. Demand-based models projected from current utilization rates include all of the "equities" and "inequities" of the present health care system in the extrapopulation of future service and physician requirements. It is generally assumed that demand-based models underestimate the actual needs over the long-range planning horizon. If attempts were made to improve the future utilization of services by individuals through expanded health care insurance coverage and other expenditures, a shortage of physicians in the late 1980s and 1990s would increase health care costs and limit the ability to achieve the health care system objectives or new health policies. (5)

6. Need-based models are known to produce physician requirements for the short and long-term planning horizon in excess of what citizens in the marketplace can utilize and purchase. Again, the assumed health system goals and existing (and future) health policies need to be linked or at least identified before selecting a model and a specific physician projection technique. (5) Ideally an AHEC program with the regional or state agency would have the professional capability and the financial resources to conduct a demand-based model projection and compare it with a need-based model projection. The comparison of the output requirements would indicate the current need if the demand-based estimate were below the need-based estimates, and non-medically justified excess use if the demand-based estimate exceeded the need-based estimate. (8)

7. The disparity among the results in the studies of physician requirements is related to the different goals and purposes for which various forecasting methods were developed. GMENAC's preliminary report noted that the choice of method or model for analysis requirements should relate to the purpose to be served by the model. Each model and specific technique requires a variety of definitions and assumptions that are sanctioned by and found credible with the group or entity conducting the study. These definitions and assumptions direct the analysis and influence the outcomes. (5)

SECTION II: RELEVANCE AND APPLICABILITY OF TECHNIQUES TO THE EASTERN VIRGINIA AHEC PROGRAM

The initial selection of techniques to review for use by the Eastern Virginia AHEC Program was based on a broad literature search. The four techniques chosen each had specific elements marking them as important and worth consideration.

Two techniques, GMENAC (developed by the Graduate Medical Education National Advisory Committee) and Economic (Effective) Demand (adopted by the State Council of Higher Education's Primary Care Physicians study) (10) have direct policy implications and program funding impacts on medical education and on AHEC programs. GMENAC has set the requirements for physicians by specialities on the national level. The SCHE study has provided the same for primary care physicians in the state of Virginia.

Use of the GMENAC techniques at the AHEC service area or regional level would apply nationally derived data and assumptions to project local requirements. The variations among specialties at the regional level could be compared with those for the nation. Likewise, the utilization of the SCHE technique on the region would show the impact of the assumptions, definitions and data requirements of the SCHE study on the regional population. Using the SCHE approach has practical advantages for in that the region's requirements can be related to the State's projected requirements in absolute numbers and precentages.

The other techniques, Health Needs Approach and Health Manpower to Population Ratio, were chosen on the basis of historical use. All need-based models, including GMENAC, are a derivative of the Health Needs Approach. In order to achieve a complete understanding of GMENAC, a working knowledge of the Health Needs Approach was felt to be a prerequisite. The technique used most frequently when assessing health care providers is the Health Manpower to Population Ratio. This traditional technique has the advantage of simplicity and minimal data requirements.

A technique used by the Eastern Virginia AHEC Program must fulfill the needs of the evaluation plan. Thus, in this section, four techniques are discussed with respect to their: 1) relevance to the objectives of the AHEC program, 2) data requirements and 3) adaptability for projecting primary care physician requirements.

Relevance to the AHEC Program

The Eastern Virginia AHEC Program, in its evaluation plan, defined the need to assess the impact of AHEC on the geographic and speciality distributions of health practitioners. An assessment of the current and future requirements of health care providers is necessary to complete this task. All four of the selected techniques -- GMENAC, Health Needs, Economic (Effective) Demand and Health Manpower to Population Ratio -- generally meet this requirement.

Of the four, only the GMENAC technique is responsive to a multitude of conditions and changes within society and the population. The estimates derived from this technique are based upon need, yet are also adjusted for actual demand. In terms of relevancy, GMENAC would provide less biased requirements by specialty than the other models because it accounts for all factors.

The other three techniques each have certain limitations with respect to the task of projecting the current and future health care practitioner requirements. The Health Needs Approach uses health needs of the population as the main criterion for deriving estimations. This technique assumes that there are no financial, psychological or social constraints to seeking care, such as, the patient's willingness to seek services. The Economic (Effective) Demand technique assumes that the requirement for health services is in direct response to the demographic characteristics of the population. Thus, a change in service demands occurs because of a change in population size and composition; other factors (e.g., productivity costs or technological changes) have no direct impact on requirements. Of all the techniques, the Health Manpower to Population Ratio is the most simplistic. Requirements are based on multiplying a subjectively derived ratio of practitioners to population (indicative of a desired level of care) by the current and projected population to estimate the present and future health practitioner requirements. This technique assumes that change in population is the only factor affecting practitioner requirements.

Data Requirements

In selecting a technique, data requirements are crucial. No matter how relevant or responsive a technique may be to a program's objectives, the lack of appropriate data renders a technique useless. With respect to the AHEC program, the evaluation staff has concluded that the data, to the degree possible, must be reflective of the local characteristics, needs and resources. Use of national data by the AHEC, would imply that the region is like the nation. Since AHEC areas are by definition medically underserved the use of national data would have to be reviewed with respect to its usefulness.

The most detailed of the four techniques, GMENAC has the most demanding data requirements. This technique necessitates information on: population; prevelance and incidence of disease by age, sex and race; productivity of physicians by specialty; norms of care and content of physician practice by specialty. This data is available only at the national level. This approach can be used if it is assumed that the national data is reflective of the local situation. If this is not believed to be a valid assumption, data for all elements would have to be gathered at the state and local levels -- a costly process and, in some cases, beyond the jurisdiction of the AHEC Program. If the GMENAC report is accepted as the "bible" for national policy decisions on medical education, demand for the data at State and local levels will increase. Until that time, the GMENAC model cannot be used to estimate health practitioner requirements for the AHEC Program as much of the national data is not reflective of the medically underserved situation of the service areas.

The Health Needs Approach (11) is less complicated than GMENAC because it does not require adjustments for utilization of services. This approach does require extensive data on prevalence and incidences of health problems, treatment of these problems, and population characteristics. Data on productivity and content of practice by specialty are also required. The availability of much of the necessary data only on a national level limits the appropriateness of the Health Needs Approach to the AHEC program. Information collected by the Virginia Health Survey (VHS), (12) may prove useful in meeting some of the data requirements. Whether it is appropriate to utilize information from both national and state sources to fulfill different data requirements needs to be explored. If data should become available on the state or local level, this technique could be used to estimate the need for physicians by specialty groups and with modifications be assessed for estimating the need of other health care

occupation. Until that time, this method cannot be employed to arrive at realistic estimates for AHEC service areas unless it is assumed that national data is reflective of the region.

The two demand-based techniques, Health Manpower to Population Ratio and Economic (Effective) Demand, base estimates on utilization of services. These techniques require data on demand for services, not on the health needs within a population. Like the two need-based techniques, data are required on population (age, sex and geographic location) and current supply of health practitioners.

The Health Manpower to Population Ratio requires minimum data on population, current practitioner supply and a comparison ratio. This technique can be used by the Eastern Virginia AHEC program, by accessing the physician information available to the project from studies done during the last five years. The population data are available from the State Office of Planning and Budget and ratios can be selected from a review of other national and state studies.

The main drawback of this technique is that subjectivity of the selected comparison ratio can result in biased estimates. In order to compensate for that weakness, comparison ratios can be selected which suggest minimal, adequate and optimal levels of care. However the defining of the levels interjects other subjective assumptions. This technique is best used for comparing area "a" with area "b", to gain a general overview of the situation for the short-term.

The Economic (Effective) Demand technique used by the SCHE for its report on primary care physicians in Virginia does not require unaccessible data. As stated above, the data on population and current supply are available and information on utilization of services can possibly be obtained from the Virginia Health Survey (VHS). In addition, some local data on utilization, are available from the Health Systems Agency. While the data sources, such as VHS, need to be further explored, it is felt that this model can be utilized in an effective manner by the AHEC program.

Conclusions Concerning the Projection of Physician Requirements

Given the necessary data, all four techniques can be used to project current and future requirements for primary care physicians. GMENAC would provide the best estimates since they can be derived by individual specialties. Additionally, GMENAC takes into account the primary versus specialty care provided by a specific type of physician. Generally, the authors of the paper conclude that the need-based models (GMENAC and Health Needs Approach) provide more relevant data, because the estimates are based on the health needs of the population. However, data unavailability prohibits the use of these techniques.

On the other hand, demand-based models (Health Manpower to Population Ratio and Economic (Effective) Demand, while not reflecting the needs of the population, do provide valid estimates. In eastern Virginia, the data necessary for the demand-based techniques are more readily available. Modifications, such as analyzing the information on geographic levels of urban and rural and by sex and age, would limit some of the underestimating inherent in demand-based techniques. Additionally, the special demographic characteristics of the AHEC areas can be taken into account.

Thus, the assessment of health practitioners in the Eastern Virginia AHEC Program will be accomplished by using both of the demand-based techniques, Health Manpower to Population Ratio and Economic (Effective) Demand. If the data required by the GMENAC or Health Needs Approach become available, efforts will be made to include an analysis based on these techniques.

SECTION III - IMPLICATIONS FOR AHEC PROGRAM PLANNING IN EASTERN VIRGINIA

Section 781 of the Health Professions Educational Assistance Act (Public Law 94-484) under which the Eastern Virginia AHEC program operates requires the AHEC Program to:

> access the health manpower needs of the area served by the center and assist in the planning and development of training programs to meet such needs.

Thus, educational program planning is the raison d'etre of the practitioner need and demand projections. It should be recognized that these projections are more valid when they are supported by historical and current practitioner supply data. In this respect, the Eastern Virginia Area Health Education Center Program is fortunate in its ability to access a physician data base maintained by the institution since 1975.

The program elements for the education of medical students at the Eastern Virginia Medical School and the AHEC components of that program are shown on a chart following this page. The AHEC arranges and sponsors selected clinical courses by decentralizing training away from the Eastern Virginia Medical Center to the AHEC service areas. The only constraints are cooperation with the various medical school departments and compliance with Section 781 requirements that "no less than 10% of all undergraduate medical . . . education" be conducted at locations sponsored by the AHEC. The AHEC currently is working to meet this 10% off-campus training requirement by initiating primary care opportunities in all three phases of the curriculum.

EASTERN VIRGINIA MEDICAL SCHOOL
Clinical Components of the Curriculum

Phase	AHEC Involvement	Total No. Of Weeks	Clinical Component
I		1	Physical diagnosis (30-40 hours within Introduction to Clinical Medicine (ICM) Course).
	✓	1	Preceptorships for 10 half-days Principally in primary care: within ICM course.
II		56	Clerkships, Oct.-Dec. (15 month cycle). One of the 8-week clerkships and the 4-week surg. occur in Phase III.
			12 Weeks: Medicine
			8 Weeks: General Surgery
	✓		---------- Pediatrics*
	✓		---------- Family Medicine**
			Psychiatry
	✓		---------- Obstetrics/Gynecology
			4 Weeks: Surg. Subspecialty
			Selective for 4 Weeks.
III	✓	20	Selectives for 20 weeks. (Selectives occupy a total of 28 weeks, including 4 weeks in Phase II and 4 weeks in basic science). Selectives range in length from 2 to 12 weeks, the standard being 4 weeks. Most are community hospital-based.
		82	Total clinical weeks.

*8-week pediatric clerkship include a 3-week outpatient rotation, mainly taken at two hospitals (Children's Hospital of The King's Daughters and the Naval Regional Medical Center and its clinic).

**8-week Family Practice clerkship, taken 16 students at a time, occurs over a wide geographic region. Approximately 60% of students take this clerkship in Phase II, the remainder in Phase III.

The development and placement of AHEC educational components in a selected jurisdiction will be influenced by the evaluation of the existing physician resources and the projected physician demands. The processes and outcomes of the overall AHEC program and the Medical School will be shaped by the evaluation plan which includes analysis of health care professionals and related resource factors. At this stage of the evaluation process, the Health Manpower to Population Ratio technique is the principle method being used by the AHEC program to analyze future supply of and demand for health care providers.

Use Of the Health Manpower To Population Ratio Technique And The Physician Data Base

The physician data file maintained by the institution has detailed information on the following characteristics of physicians in the region: name, Board Certification status, sub-specialty, school of graduation, academic department standing, active hospital staff privileges and principle business address. This data base allows the program's staff a broad knowledge about the physician resources in any geographic area of interest. It also identifies the number and names of individuals who have a particular specialty and are possible preceptor candidates for student training programs or potential participants in continuing education and other related educational activities. The data base is used as a communication tool for disseminating information on program activities.

The calculation of the physician to population ratio for 1980 is the third observation made from this physician data base; previous observations were made in 1975 and 1978. Observations for earlier years are available only from secondary data sources such as the American Medical Association's (AMA) master files and publications but they would not provide the same consistency or quality of data. The

1975, 1978 and 1980 data do not, at this time, allow for a trend line analysis of the physician to population ratio, but the data can be compared for informational purposes. (Table 1 and 2) Additional observations for 1981 and subsequent years will provide the data necessary for a trend line analysis that can be related to attempts by AHEC, local governments, hospitals, private industry and community groups to modify physician resources in a service area.

The evaluation staff used the Health Manpower to Population Ratio technique to project the current demand for physicians. Ratios were selected from 1975 and projections made for 1978 and 1980. Tables 3 and 4 display the projections based on the selected comparison ratios. These projections (Table 3) have not been validated, but the estimates can be compared with the results obtained from the Economic (Effective) Demand technique. Additionally, this technique appears useful for estimating the future supply when population projections are multiplied by the base year ratio of the area in question. (Table 4)

The program planning and development phases have been ongoing for less than two years. Preliminary indications of current and future physicians demands are helpful as early as possible in program development to assist in the planning process. For this reason, analysis of the characteristics of the physicians located in the AHEC service area and preliminary estimates of demand were prepared. The 1980 physician to population ratio data for the AHEC service area, the Eastern Virginia Health SErvices Area (HSA V), the State of Virginia and the United States provide the program with comparison data and preliminary indications of the specialty availability by jurisdiction.

TABLE ONE

CHANGES IN PRIMARY CARE PHYSICIANS AND POPULATION

WESTERN TIDEWATER AHEC

1975 - 1978

JURISDICTION	PRIMARY CARE PHYSICIANS 1975-1978	1978-1980	POPULATION 1975-1978	1978-1980	1978-1981
Chesapeake	23%	26%	8%	1%	6%
Franklin	11%	20%	- 4%	3%	- 1%
Isle of Wight	33%	0%	4%	3%	3%
Southampton	25%	-40%	10%	- 5%	6%
Suffolk	42%	- 4%	- 1%	1%	-.07
TOTAL	27%	9%	5%	1%	5%

Source: Office of Planning & Development, Eastern Virginia Medical Authority 1975, 1978 and 1980 Physician Data provided by the State Board of Medicine.

State Population Projections 1980 - 2000, State Office of Planning and Budget, March 1980.

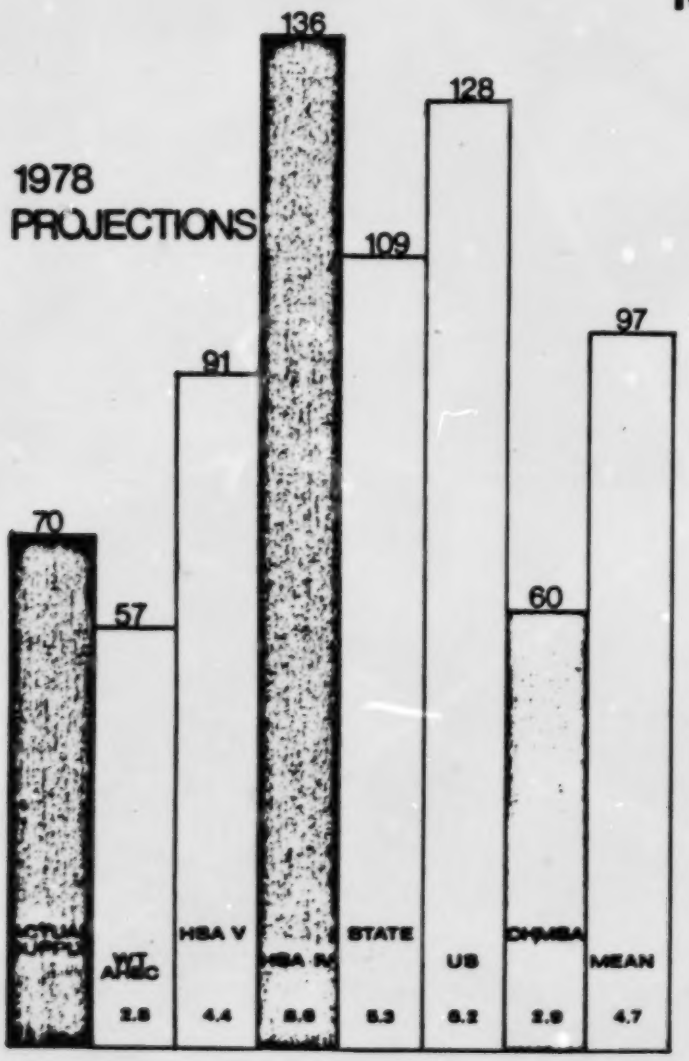
TABLE TWO

PRIMARY CARE PHYSICIANS
DISTRIBUTION BY AGE GROUPS
WESTERN TIDEWATER AHEC
1975 - 1978

AGE GROUPS	1975	1978	1980
≤ 30	1	4	4
31 - 35	4	12	10
36 - 40	4	11	10
41 - 45	8	6	13
46 - 50	10	5	5
51 - 55	8	7	8
56 - 60	8	11	9
61 - 65	2	3	9
66 - 71	8	8	5
> 71+	2	3	3
TOTAL	55	70	76
AVERAGE AGE	52	48	49
≤ 55	64%	64%	66%
> 55	36%	36%	34%

Source: Office of Planning & Development, Eastern Virginia Medical Authority 1975, 1978 and 1980 Physician Data provided by the State Board of Medicine.

PROJECTIONS BASED ON COMPARISON RATIOS
1975



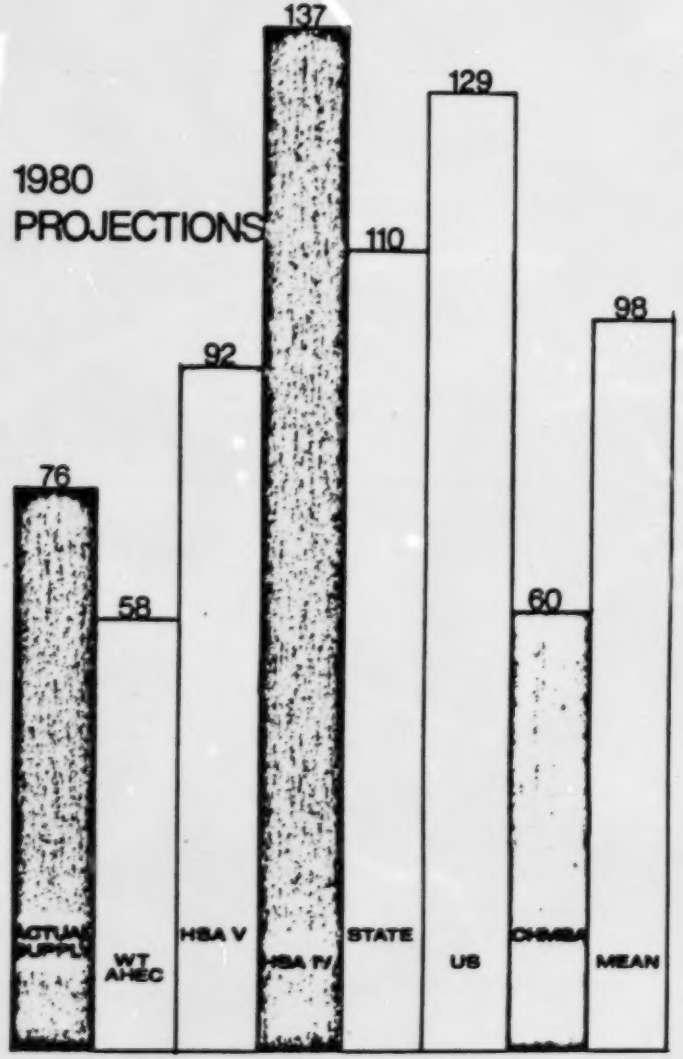
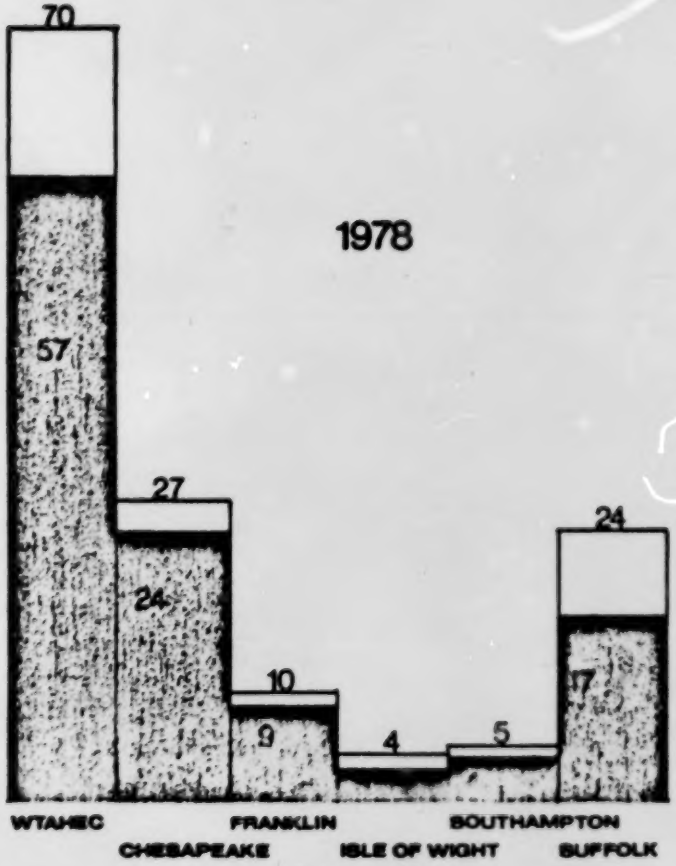


TABLE THREE

PROJECTIONS BASED ON LOCAL 1975 RATIOS



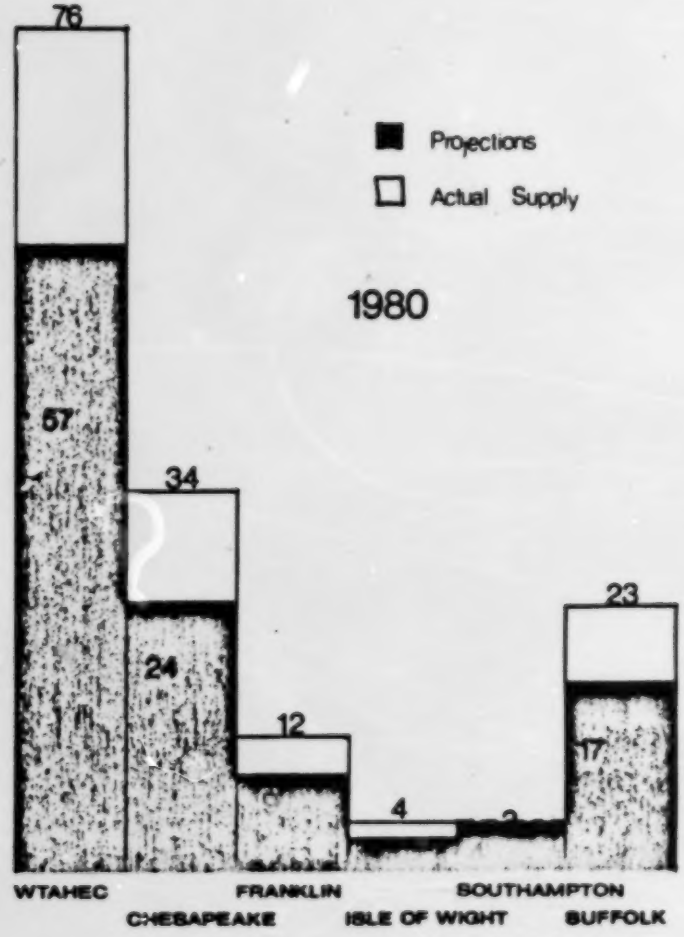


TABLE FOUR

The physician to population ratio technique and the physician data base have supplied much of the data necessary for preliminary program planning. The Health Manpower to Population Ratio has provided the AHEC program with initial forecasts of future trends. Additionally, the analysis done to date indicates that the use of the ratio for the smallest unit of analysis (the local county or city) can predict the future supply of physicians. The historical data in conjunction with current data allow for the analysis and depiction of the impact of the educational interventions and local initiatives. The program expects to continue to use these methods throughout the project period and experiment with the Economic (Effective) Demand technique to measure future demand for physicians by specialty using a more complete set of variables. This technique, as earlier described, bases future physician needs upon current utilization patterns.

Continued Evaluation Efforts

The overall evaluation system depicted in the chart on page 2 of this paper encompasses other components beyond health professions analysis. The student recruitment and retention component of the evaluation system tracks students from their educational experiences in the AHEC program to their actual practice sites. This supplies the outside feedback loop to document the career choice impact of the AHEC on practice location, both within and outside of designated service areas.

The health professions component of the evaluation plan remains one of the more critical segments of the evaluation system because it describes the specific needs of the areas and also tracks the ultimate impact of the program. The continuation of this evaluation protocol is expected to aid in the development of the program as it expands to the other service areas. During that time, various techniques will be reviewed, resulting in the selection of one which is responsive to the contract requirements and reflective of the needs of the service areas.

APPENDIX I

GLOSSARY OF TERMS

AHEC - Area Health Education Center.

CHMSA - Critical Health Manpower Shortage Area.

EVMA - Eastern Virginia Medical Authority.

EVMS - Eastern Virginia Medical School.

HSA - Health Service Area.

GMENAC - Graduate Medical Education National Advisory Committee.

Primary Care Physicians - Physicians specializing in Family Practice, Internal Medicine and Pediatrics.

SCHE - State Council of Higher Education.

WTAHEC - Western Tidewater AHEC - first program site for Eastern Virginia AHEC.

CHARACTERISTICS OF NEED-BASED AND DEMAND-BASED MODELS

NEED-BASED	DEMAND-BASED
PHYSICIAN REQUIREMENTS BASED ON THE PHYSICAL DISABILITIES AND DISEASES OF THE POPULATION	PHYSICIAN REQUIREMENTS BASED ON THE UTILIZATION OF SERVICES BY THE POPULATION
USES PROFESSIONAL PANELS TO DEFINE PHYSICIAN PRODUCTIVITY, TIME NEEDED FOR TREATMENT AND LENGTH OF TREATMENT FOR EACH DISABILITY OR DISEASE	USES OBSERVATIONS OF MARKET BEHAVIOR TO DEVELOP RATES OF UTILIZATION
PREVALENCE RATES ARE DETERMINED AND MULTIPLIED BY THE PROJECTED POPULATION TO DERIVE THE AT-RISK POPULATION GROUP	CAN DEFINE RATES FOR A SUB-GROUP OF THE POPULATION AND DETERMINE THE FUTURE DEMANDS FOR THE SUB-GROUP
DOES NOT CONSIDER CONSUMER CHOICE, ACCESSIBILITY, AVAILABILITY, OR FINANCIAL CONSTRAINTS. NOR DOES THIS MODEL ADJUST FOR: A. MEDICALLY NEEDY PERSONS WHO DO NOT SEEK HEALTH SERVICES B. PERSONS WHO DO NOT RETURN FOR FOLLOW-UP CARE C. MEDICALLY NEEDY PERSONS THAT ARE NOT ACCEPTED INTO THE SYSTEM	ASSUMES THAT A CHANGE IN POPULATION WILL RESULT IN A PROPORTIONATE CHANGE IN THE DEMAND FOR SERVICES. DOES NOT CONSIDER THE UNMET HEALTH NEEDS OF THE POPULATION
TENDS TO PROJECT PHYSICIAN REQUIREMENTS THAT ARE HIGHER THAN CAN BE UTILIZED BY THE MARKET. THIS IS DUE TO NO ADJUSTMENT FOR NON-USERS	TENDS TO UNDERESTIMATE THE ACTUAL REQUIREMENTS FOR PHYSICIANS. THIS IS DUE TO NO ADJUSTMENT FOR THE NEEDS OF THE POPULATION
PROVIDES LONG-TERM PROJECTIONS	PROVIDES SHORT-TERM PROJECTIONS WHICH ARE USEFUL FOR TESTING PROGRAMS OR POLICY CHANGES AT THE NATIONAL OR STATE LEVEL
REQUIREMENTS BY INDIVIDUAL SPECIALTIES CAN BE OBTAINED	REQUIREMENTS BY SPECIALTY ARE DIFFICULT TO OBTAIN
TWO TYPES: TRUE NEED-BASED ADJUSTED NEED-BASED	THREE TYPES: DEMOGRAPHIC ECONOMY-BASED ECONOMIC

CHARACTERISTICS OF FOUR TECHNIQUES

TECHNIQUES	DATA REQUIREMENTS	ASSUMPTIONS	STRENGTHS	WEAKNESSES
ADJUSTED NEED-BASED:				
GMENAC	Incidence and prevalence of diseases and disabilities Population* Norms of care Practice content Productivity	That the needs of the population and the demands of the population are both factors in projecting the requirements for health providers	Bases requirements on both need and utilization data Requirements by specialties can be obtained Characteristics of the population are taken into account	Requires a great deal of data Data only available at the national level Great deal of expertise required to use technique
NEED-BASED:				
HEALTH NEEDS APPROACH	Incidence and prevalence of diseases and disabilities Population* Norms of care Productivity	Community's needs are a relevant criterion for determining practitioner requirements	Bases requirements for practitioners on the needs of the population	Data difficult to obtain on local level Difficult to define appropriate norms of care Willingness to seek services and ability to pay not included
DEMAND-BASED:				
HEALTH MANPOWER/ POPULATION RATIO	Population* Current supply of practitioners Comparison ratio	Change in the population will require a proportionate change in the number of practitioners needed to assure adequate care All other demand and supply factors are unimportant	Requires a limited amount of date Minimum Cost Simple analytical technique	Ignores all factors except for changes in population Selection of comparison ratio is subjective
ECONOMIC (EFFECTIVE) DEMAND	Population* Supply of practitioners* Utilization of services	Demand for health services is determined by demographics of the population Like groups will con't to use services in same ways Other variables affecting demand will not change	Provides detailed behavior study of the group seeking services Utilization data is reliable measure of demand	Requires a great deal of data First assumption has not been validated Ignores that there are many unmet health needs

Notes: * indicates that data is required for base year and projected year. Demographic characteristics are needed on age and sex of the population.

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